

MEETING SUMMARY

From: M.B. Skorska
Phone: 373-3978
Date: March 24, 2011
Location: WRPS Office
Subject: RFI Development

To: Distribution/Attendees

Attendees: Mike Barnes, ECOLOGY
Beth Rochette, ECOLOGY
Jeff Lyon, ECOLOGY
Rebecca Gerhart, EPA
Bob Lober, DOE
Maria Skorska, WRPS
Susan Eberlein, WRPS
Janet Badden, WRPS
Dwayne Crumpler, Columbia Energy

MEETING PURPOSE: The purpose of this meeting was to discuss the development of RFI Sections 2, 3, and 4. Due to insufficient time Section 4 will be discussed during the next monthly RFI meeting.

RFI Sections 2 and 3 Development.

DOE presented draft annotated outlines for Sections 2 and 3 along with checklists for these Sections and the content of RFI Sections 2 and 3 was discussed and the following was agreed to:

- Table 2-1 will include an additional column with notes when data was collected.
- The RFI will address impacts on groundwater under WMA C including a description of the existing RCRA groundwater monitoring program.
- A substantial amount of historical information will be included to effectively illuminate the RFI. The RFI will be comprehensive enough so that the document will stand on its own and reviewers not familiar with Hanford in general and WMA C in particular can review the document without having to seek information in referenced documents.
- Timelines being developed by Les Fort for individual tanks will be incorporated into the RFI as they clearly show the issues with individual tanks (i.e., overfill, plugged lines, waste in the tank, and tank status).

Next Meeting

Date: April 21
Time: 9:00-11:00
Location: Ecology Office

Robert Lober

DOE Project Manager (print)

[Signature]

DOE Project Manager (signature)

8/3/2011

Date

Jeffery J. Lyon

Ecology Project Manager (print)

[Signature]

Ecology Project Manager (signature)

8/3/11

Date

ACTIONS

Action number	Action required	Actionee	Status
3/14/11-1	Define the process by which sections of the draft RFI would be reviewed, revised, and maintained under configuration management during development.	S. Eberlein, B. Lober, J. Lyon	In progress.

ATTACHMENT 1

Ecology's comments included

1.0 Overview

Reserved.

2.0 Approach for Characterizing Releases to Soil

This section will describe the following:

- A summary of the Phase 1 field investigation work and history that led to the development of the general approach and scope for the Phase 2 field investigation.
- The overall DQO process for Phase 2 field investigation at WMA C described in *Data Quality Objectives Report Phase 2 Characterization for Waste Management Area C Corrective Measures Study* (RPP-RPT-38152) and
- A general description of the 23 areas of interest being evaluated in the Phase 2 Characterization program using a variety of characterization techniques.

This section will discuss the rationale and approach for characterizing releases to soils including the following:

- Various conceptual site models presented in Section 3.3 of *Phase 2 RCRA Facility Investigation/Corrective Measures Study Work Plan for Waste Management Area C*, RPP-PLAN-39114,
- Regulator's input through the DQO process.
- Ecology's desire to achieve the following goals during this Phase 2 characterization effort:
 - More detailed evaluation of UPR sites associated with WMA C,
 - Consideration of stakeholder and Tribal Nation concerns related to contaminant migration in the characterization effort,
 - Characterization of near-surface (less than 15 ft bgs) soil samples to support direct contact and ecological risk assessment,
 - Examination of other potential areas of unintentional releases associated with the ⁹⁹Tc groundwater contamination and,
 - Evaluation of the ability to close WMA C after retrieval completion.

The key documents that contain the information that will be described in this section include:

- *Data Quality Objectives Report Phase 2 Characterization for Waste Management Area C Corrective Measures Study* (RPP-RPT-38152), which addresses Ecology's concerns and provides a sampling strategy focused on addressing associated data needs, and
- Section 4.4 of *Phase 2 RCRA Facility Investigation/Corrective Measures Study Work Plan for Waste Management Area C*, RPP-PLAN-39114.

2.1 General Approach

This section will summarize the general approach, area of investigations within and surrounding WMA C, and the general methods of investigation. Table 2.1 provides the locations, method of investigation, number of proposed soil samples, and sampling completion dates.

As a working framework for the characterization of releases to soils at WMA C, this section will also provide a discussion of the recent interpretations of the overall WMA C conceptual model that currently includes the following five alternative conceptual models of contaminant fate and transport at WMA C:

- An alternative conceptual model that considers the effects of enhanced flow and contaminant movement along the stratigraphic dip of the underlying hydrogeologic units (This conceptual was provided specifically by the Nez Perce)
- An alternative conceptual model(s) based on interpretations of Phase 1 and limited Phase 2 characterization that considers only the effects of known leak events and losses and recharge from natural sources.
- An alternative conceptual model that includes the fine details of micro-scale heterogeneity in the geologic model, as heterogeneity has an effect on the ratio of lateral to vertical transport under unsaturated flow. Sensitivity studies to determine the scale of elements that must be included to adequately represent the stratigraphy and be beneficial to simulation.
- Other alternative models to previous alternative model that consider the potential effects from other factors and uncertainties on flow and contaminant transport through the vadose zone to ground water including :
 - potential effects of additional recharge from operational uses of water
 - the potential effects of preferential pathways along existing dry wells, boreholes, or clastic dikes
 - potential effects of an unknown leak event or events.

Comment [bar1]: We should discuss how these conceptual models and associated modeling efforts relate to the WMA C PA evaluations. Is there overlap? If not, these evaluations should also be included in the PA.

Detailed summaries of these alternative conceptual models of WMA C and related discussions are provided in a number of different reports that include:

- *Data Quality Objectives Report Phase 2 Characterization for Waste Management Area C RCRA Field Investigation/Corrective Measures Study* (RPP-RPT-38152), and
- *Phase 2 RCRA Facility Investigation/Corrective Measures Study Work Plan for Waste Management Area C* (RPP-PLAN-39114)

- RPP-RPT-41918, Rev. 1, *Assessment Context for Performance Assessment for Waste in C Tank Farm Facilities after Closure*
- RPP-RPT-46088, Rev. 1, *Flow and Transport in the Natural System at WMA C*
- RPP-RPT-48490, Rev. 1, *Technical Approach and Scope for Flow and Contaminant Transport Analysis in the Initial Performance Assessment of Waste Management Area C*

All five of these conceptual models of contaminant fate and transport are considered valid alternatives for WMA C and together they form the overall WMA C site conceptual model.

Table 2-1. Sample Plan WMA C Phase 2 Characterization for RFI/CMS (3 sheets)

Map Design	Group ^a	Location	Deployment	Number of Holes	Average Number of Samples	Known or Suspected Event	Objective	Accessibility	Ecology/ Stakeholder Interest	Date Completed
A	G3	Spare inlet 241-C-101	Direct push, slant	1-2	8	Tank overflow. Loss through spare inlet	Characterize C-101 release and refine conceptual models 1, 2, and 4	Fair	High	
B	G2	241-C-101 south side	Direct push, vertical or slant	1	8	Tank release	Characterize C-101 release and refine conceptual models 1 and 2	Good	High	
C	G4	241-C-203	Direct push, slant	3	3: 0-15 ft 15: >15 ft	Tank leak and/or tank overflow. Loss through spare inlet	Determine if C-200 actually leaked and refine conceptual models 1, 2, and 4	Fair	Moderate to high	
D	G4	241-C-201 241-C-202 241-C-204	Direct push, slant	1-2/tank	8	200 series tank leaks	Determine if C-200 actually leaked and refine conceptual models 1, 2, and 4	Fair	Moderate, depending on C-203 results	
E	G2	Between 241-C-106 and 200-C-109	Direct push, vertical	1	8	Suspected release	Assess ⁶⁰ Co and refine conceptual models 1, 2, and 4	Fair	High	
F	G2	Bldg C-801 chemical drain	Direct push, vertical	1	8	Suspected release site	Assess release of PUREX waste, ¹³⁷ Cs and ⁹⁹ Tc, and ⁶⁰ Co and refine conceptual models 1, 2, and 4	Good	Moderate to high	
G	G2	Between Bldg C-801 and 241-C-103	Direct push, vertical	1	8	Suspected transfer line release site	Assess release and ⁶⁰ Co and refine conceptual models 1, 2, and 4	Good	High	
H	G5	Northeast side of E-91	Direct push, vertical	1	8	Surface release	Surface exposures and assess ⁶⁰ Co and surface release conceptual Model	Good	High	
I	G5	Northeast side of E-115	Direct push, vertical or slant	1	8	Surface release	Surface exposures and assess ⁶⁰ Co and surface release conceptual model, refine conceptual models 1, 2, and 4	Good	High	
J	G3	241-C-104	Direct push, slant	1	8	Tank release	Assess suspected release and refine conceptual models 1, 2, and 4	Fair	High	
K	G2	241-C-108	Direct push, vertical or slant	1	8	Transfer line leak, hot dry well (09-02)	Assess suspected release and refine conceptual models 1, 2, and 4	Poor	High	
L	G2	241-C-103 and 241-C-106	Drywell logging and direct push, vertical	2 / log drywells	8	Potential transfer line leak and tank overflow	Update logging data for ⁶⁰ Co, ¹³⁷ Cs, uranium, and moisture and assess potential release and refine conceptual models 1, 2, and 4	Fair	Moderate	

Table 2-1. Sample Plan WMA C Phase 2 Characterization for RFI/CMS (3 sheets)

Map Design	Group ^a	Location	Deployment	Number of Holes	Average Number of Samples	Known or Suspected Event	Objective	Accessibility	Ecology/ Stakeholder Interest	Date Completed
M	G7	241-C-104, 108, 109, 110, 111, and 112	Drywell logging	N/A	N/A		Update logging data for ⁶⁰ Co, ¹³⁷ Cs, uranium, and moisture	Fair to good	Moderate	
N	G8	UPR-86, UPR-82 and UPR-81	SGE	N/A	N/A		Test SGE: resolve depth with deep electrodes; define plume at UPRs-81, -82 and -86; refine conceptual models 1, 2, and 4	Good	High	
O	G9	WMA C	SGE	N/A	N/A		3-D vision of suspected releases – may lead to supplemental sample locations	Good	High	
P	G1	UPR-81	Balance of direct pushes to complete characterization for soil sampling	3	8	Known release site	Characterize release and refine conceptual models 1, 2, and 4	Good	High	
Q	G6	UPR-82	Direct push through center of UPR-82	1	8	Known release site	Penetrate center of mass, and refine conceptual models 1, 2, and 4	Good	High	
R	G2	241-C-301 Catch Tank	Direct push vertical	1	8	Unlined concrete catch tank	Assess potential catch tank release and refine conceptual models 1, 2, and 4	Good	Moderate to high	
S	G5	UPR-72 and C-8 Drain	Direct push vertical	1	8	Buried radioactive material and French drain from 241 CR Building are in this area	Assess presence of buried material and potential releases to C-8 drain and refine conceptual models 1, 2, and 4	Good	Moderate to high	
T	TBD	TBD, based on SGE data for entire WMA	TBD, direct push vertical and/or slant	TBD	TBD	Previously unknown release sites	TBD	TBD	Moderate to high	
U	G3	C-110	Direct push, slant	1	8	Tank leak and/or tank overflow. Loss through spare inlet	Characterize C-110 release and conceptual conceptual models 1, 2, and 4	Fair	High	

Table 2-1. Sample Plan WMA C Phase 2 Characterization for RFI/CMS (3 sheets)

Map Design	Group ^a	Location	Deployment	Number of Holes	Average Number of Samples	Known or Suspected Event	Objective	Accessibility	Ecology/ Stakeholder Interest	Date Completed
V	G2	C-111	Direct push vertical	1	8	Tank leak and/or tank overfill. Loss through spare inlet	Characterize C-111 release and conceptual conceptual models 1, 2, and 4	Fair	High	
W	G9	299-E27-4, 299-E27-12, 299-E27-13, 299-E27-14, 299-E27-15	Log groundwater monitoring wells outside of WMA C				Log wells to collect data on U, ⁶⁰ Co, ¹³⁷ Cs, and moisture	Good	High	

Yellow highlighted rows indicates sampling analysis has occurred for these sites. Green highlighted rows indicate field work planned for 2011..

^a Group refers to the expected work package associated with the characterization effort broadly defined as follows:

G1 = Direct push at UPR-81 (covered by existing work package).

G2 = Vertical direct pushes at nine investigative sites around the 100-series SSTs.

G3 = Slant direct pushes at three investigative sites around the 100-series SSTs.

G4 = Slant direct push at the C-200 Series tanks.

G5 = Outside the WMA, vertical direct push at the investigative sites.

G6 = Vertical direct push through gunite at UPR-82.

G7 = Drywell logging at select dry wells.

G8 = Three separate SGE areas at the following locations: UPR-81, UPR-82, and UPR-86.

G9 = Deploy SGE at WMA C taking into account the results from testing at site N.

2.2 Inter-media Transport

This section will discuss soil contamination leaching to groundwater in the past, currently and in the future. The focus is on potential risk pathways evaluated in the WMA C PA process. WMA C releases to the soils have already impacted groundwater.

The following information that corresponds to the RFI Checklist Questions 4j, 4k and 4l will be addressed:

- Potential for release from surface soils to air
- Potential for release from surface soils to surface water
- Existing soil/ground-water monitoring data

3.0 Characterization of the Contaminant Source and the Environmental Setting

This section will discuss the waste streams generated at Hanford that were stored, transferred, and remain in the C farm tanks over their operation period beginning in 1946 to present. Section 3.1 will address the physical and chemical characteristics of the waste streams stored in the individual tanks. Section 3.2 will describe design and operating characteristics of the tanks within WMA C, waste release types (point-source versus nonpoint-source) that have occurred in the past, and other related waste release characteristics. Section 3.3 presents the environmental setting of WMA C as it relates to the potential fate and contaminant transport from past waste releases and losses.

3.1 Waste Characterization

Waste characterization information in individual tanks at WMA C will be presented in this section as it relates to the identity and composition of the contaminants that may have been released to the environment. This discussion will include Les Fort's diagrams illustrating waste receipt and transfer timelines for each of the WMA C tanks.

Section 3.1.1 will present the process waste history for the 100-series tanks and the 200-series tanks in C tank farm.

Section 3.1.2 will present the rationale for the selection of the COPCs. The COPC's selection process will be described beginning with the Regulatory DQO, followed by the SST Closure DQO, and the development of COPCs tables within the *Phase 2 RCRA Facility Investigation/Corrective Measures Study Work Plan for Waste Management Area C*, RPP-PLAN-39114, *Sampling and Analysis Plan for Phase 2 Characterization of Vadose Zone Soil in*

Waste Management Area C (RPP-PLAN-38777), and Data Quality Objectives Report Phase 2 Characterization for Waste Management Area C Corrective Measures Study. (RPP-RPT-38152)

The following COPCs' parameters, identified as questions 1a through 1k on the RFI Checklist, will be addressed in this section:

- Identity and composition of contaminants
- Physical state of contaminants
- Viscosity
- pH
- pKa
- Density
- Water Volubility
- Henry's Law Constant
- K_{ow}
- Biodegradability
- Rates of hydrolysis, photolysis and oxidation
- Chemical transformations (see guidance)

We recognize that available characterization information about waste streams deposited in or transferred in and out individual tanks may not be available for all COPC parameters listed above. These will be recognized as gaps in the document.

3.2 Unit Characterization

This section will describe the tank farm facilities including their design, operating characteristics, and associated mechanisms for waste release to the environment. Information for this section will come mostly from the Leak Loss document, RPP-ENV-33418, Rev. 1 and *Phase 2 RCRA Facility Investigation/Corrective Measures Study Work Plan for Waste Management Area C*, RPP-PLAN-39114. This section will also utilize some scope and content provided in RPP-RPT-46879, Rev. 1, *Corrosion and Structural Degradation within Engineered System in Waste Management Area C* that was prepared for the WMA C PA Working Session on Man-Made System #2 held in July 27-29, 2010.

The following information that corresponds to the RFI Checklist Question 2a, 2b and 2d will be addressed:

- Age of unit
- Construction integrity
- Location relative to ground-water table or bedrock or other confining barriers

3.2.1 Unit Design and Operating Characteristics

This section will address tank design and operations and how these factors are related to waste releases to the environment. This section will describe how waste was routinely transferred through 9 miles of pipelines during several different waste campaigns and how most tanks in C farm that had waste losses were occasionally overfilled (refer back to Les Fort's diagrams). Other factors related to water use in site operations will also be addressed in this section to better understand how they could have affected past releases from tanks and/or pipelines (i.e., routine testing of fire hydrants, use of water to assist with excavations, use of water to wash down the surface contamination to minimize potential exposure to site workers, etc.).

This section will discuss:

- Releases that occurred from overflows, leaks through the tank shell, leakage from coupling/uncoupling operations, leaks from corroded or cracked tanks, pipelines, and other ancillary equipment -.
- The known release types will be identified including potential release locations.

Information for this section will come mostly from the Leak Loss document, RPP-ENV-33418, Rev. 1.

The following information that corresponds to Questions 2c, and 2e through 2k on the RFI Checklist will be included:

- Presence of liner (natural or synthetic)
- Unit operation data
- Presence of cover
- Presence of on/offsite buildings
- Depth and dimensions of unit
- Inspection records
- Operation logs
- Presence of natural or engineered barriers near unit

3.2.2 Release Type (Point or Non-Point Source)

This section will discuss releases from tanks, pipelines, and unplanned release sites (UPRs) that are generally considered point source releases. These point source releases are characteristically localized releases and generally create a small area of relatively high contaminant concentration surrounded by larger areas of relatively clean soil. UPR-82, UPR-86, UPR-81 are all examples of point source releases. Information for this section will come mostly from the Leak Loss document, RPP-ENV-33418, Rev. 1.

This section will also discuss airborne releases that have occurred in the past. These releases are known as non-point source releases. Few known non-point source releases have occurred at

WMA C and all were very minor. Some of these have resulted in windblown surface contamination.

3.2.3 Depth of the Release

This section will present the depths of releases identified in Section 3.2.1 and 3.2.2. The depth range for releases in WMA C will be addressed from the surface to the bottom of the tanks depending on where the known or suspected release has occurred.

Information for this section will come mostly from the Leak Loss document, RPP-ENV-33418, Rev. 1.

3.2.4 Magnitude of the Release

This section will address the magnitudes of the releases. A table may be presented in this section to summarize the amounts of contaminants lost to the vadose zone. Methodologies for estimating the magnitude of the release will be presented, such as Cs to ⁹⁹Tc relationships for process waste streams. Ranges of waste release magnitudes also will be discussed. If the stakeholders and Tribal Nations provide a basis for the magnitude and range of a release, it will be incorporated into this section also.

Information for this section will come mostly from the Leak Loss document, RPP-ENV-33418, Rev. 1.

3.2.5 Timing of the Release

This section will discuss when the releases identified in Section 3.2.1 have occurred. Information for this section will come mostly from the Leak Loss document, RPP-ENV-33418, Rev. 1.

Time-related factors that will be considered in characterizing a release include:

- Age of the release,
- Duration of the release,
- Frequency of the release and
- Season (time of year).

A source of information that will be used to support this section includes the integrity assessment study of the 23 failed tanks (to be released soon).

3.3 Characterization of the Environmental Setting

This section will discuss the vadose zone soil's physical and chemical properties, subsurface geology, and hydrology, climate or meteorological patterns that affect contaminant migration. A topography map and surface soil map will be included.

This section will present information that is similar to that included in RPP-RPT-46088, Rev. 1, *Flow and Transport in the Natural System at WMA C* that was developed and presented the WMA C PA Working Session on the Natural System held on May 25 – 27, 2010.

3.3.1 Spatial Variability

This section will address the soil heterogeneity as it relates to contaminant fate and migration. This section will also present the variability of the lithologic units to provide a better understanding of contaminant transport in the environment.

The supportive figures and pictures will include photos of the soils collected during the field investigation, geologic cross-section or fence diagrams, geophysical logs that show variability in the soil structure (thin fine-grained units and thicker coarse-grained units), etc.

3.3.2 Spatial and Temporal Fluctuations in Soil Moisture Content

This section will discuss how spatial and temporal fluctuation in soil moisture content exists in WMA C. Site-specific information from the borehole at C4297 will be compared to data from the probeholes around UPR-81, UPR-82, and UPR-86. Soil moisture content for the exploratory probeholes at Sties L1, L2, G, R, F, E, V, H, and I will be discussed in this section.

The following information that corresponds to the RFI Checklist Questions 3c, and 2d, will be presented:

- Soil moisture content
- Location relative to ground-water table or bedrock or other confining barriers

3.3.3 Solid, Liquid, and Gaseous Materials in the Unsaturated Zone

This section will address how the contaminants of concern are bound to the soil. The three various phases of solid, liquid or gaseous may exist. This section will present the physical properties data of soils to support evaluations of the nature and extent of migration of constituents of potential concern..

The following information that corresponds to the RFI Checklist Questions 3a through 3q will be presented:

- Site soil characteristics
- Surface soil distribution map
- Soil moisture content
- Predominant soil phase to sample (solid, liquid, gaseous)
- Soil classification
- Particle size distribution
- Porosity
- Hydraulic conductivity (saturated and unsaturated)
- Relative permeability
- Soil sorptive capacity (K_{ds})
- Cation exchange capacity (CEC)
- Organic carbon content
- Soil pH
- Depth to water table
- Pore water velocity
- Percolation
- Volumetric water content

Various historic reports on the vadose zone at Hanford and the analyses of the soils will support obtaining information for this section. A key recently developed report that summarizes this information and other pertinent references to this topical area is RPP-RPT46088, Rev. 1, *Flow and Transport in the Natural System at Waste Management Area C*.

Add something about groundwater, such as flow direction and how the groundwater will be addressed.

3.4 Sources of Existing information

This section will discuss the sources of existing information for WMA C. The key document that contains initial characterization data is **RPP-35484**, *Field Investigation Report for Waste Management Areas C and A-AX*.

3.4.1 Geological and Climatological Data

The following information that corresponds to the RFI Checklist Question 4a will be addressed:

- Geological data and information
- Climatological data and information

The following key documents provide information on the geology and climate data associated with WMA C.

For geology:

- **RPP-14430**, *Subsurface Conditions Description Report for Waste Management Areas C and A-AX*
- **RPP-35484**, *Field Investigation Report for Waste Management Areas C and A-AX*
- **RPP-RPT-38152, 2008**, *Data Quality Objectives Report Phase 2 Characterization for Waste Management Area C Corrective Measures Study.*
- **RPP-PLAN-39114**, *RCRA Facility Investigation/Corrective Measures Study Work Plan for Waste Management Area C*
- **PNNL-15617**, 2007, *Characterization of Vadose Zone Sediments from C Waste Management Area: Investigation of the C-152 Transfer Line Leak.*
- **PNNL-15503**, *Characterization of Vadose Zone Sediments Below the C Tank Farm: Borehole C4297 and RCRA Borehole 299-E27-22.*
- **PNNL-14656**, *Borehole Data Package for Four CY 2003 RCRA Wells 299-E27-4, 299-E27-21, 299-E27-22, and 299-E27-23 at Single-Shell Tank, Waste Management Area C, Hanford Site, Washington, Pacific Northwest National Laboratory, Richland, Washington.*

For climate:

- **PNNL-15160**, *Hanford Site Climatological Data Summary 2004 with Historical Data*
- **PNNL-6415**, *Hanford Site National Environmental Policy Act (NEPA) Characterization,*

3.4.2 Facility Records and Site Investigations

This section will provide information on facility records and site investigations that support the general evaluation of the nature and extent of potential contamination.

The following information that corresponds to the RFI Checklist Question 4b will be addressed:

- Facility records and site-specific investigations

Key records and documents associated with facility records and site investigations are listed.

- **RPP-7494**, *Historical Vadose Zone Contamination from the A, AX, and C Tank Farm Operations*, Rev. 0, CH2M HILL Hanford Group, Inc., Richland, Washington.
- **RPP-14430**, *Subsurface Conditions Description Report for Waste Management Areas C and A-AX*
- **RPP-35484**, *Field Investigation Report for Waste Management Areas C and A-AX*
- **RPP-RPT-38152**, *Data Quality Objectives Report Phase 2 Characterization for Waste Management Area C Corrective Measures Study.*
- **RPP-PLAN-39114**, *RCRA Facility Investigation/Corrective Measures Study Work Plan for Waste Management Area C*

- **RPP-PLAN-38777**, *Sampling and Analysis Plan for Phase 2 Characterization of Vadose Zone Soil in Waste Management Area C*,
- **RPP-ENV-33418**, *Hanford C-Farm Leak Assessments Report: 241-C-101, 241-C-110, 241-C-111, 241-C-105, and Unplanned Waste Releases*,